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THE ROYAL METEOROLOGICAL SOCIETY.

WE have learned with much satisfaction that Her Majesty has been graciously pleased to grant to the Meteorological Society permission to prefix the title of "Royal," and to become henceforth the Royal Meteorological Society.

There are few societies which can show a better *raison d'être*, few of which, the output of work, (judged both by quality and quantity,) bears a higher ratio to the input of funds. Seventeen years ago the Society applied to the Crown for incorporation by Royal Charter, and that rarely-accorded honour and privilege was granted, and the Society is now further to be congratulated on obtaining Royal patronage, the only remaining distinction which any Society could obtain.

Of course these honours bring no money to the Society; its income depends almost wholly upon the subscriptions of the Fellows, and, if it is fair to judge of its future by its past, there can, we think, be no doubt, that it would be to the advantage of meteorology, of the Society, and also of many of our readers if they became candidates for election as Fellows of the Royal Meteorological Society.

THE BRITISH ASSOCIATION AT SOUTHPORT.

(Continued from page 136*).*

UNDERGROUND TEMPERATURE.

Sixteenth Report of the Committee appointed for the purpose of investigating the Rate of Increase of Underground Temperature downwards, in various Localities of Dry Land and under Water. Drawn up by PROFESSOR EVERETT (*Secretary*).

Observations have been made in the artesian well at Southampton Common by Mr. T. W. Shore, of the Hartley Institution, assited by Mr. J. Blount Thomas.

The well was sunk many years ago to a depth of 1,317 feet, and has remained closed for thirty-two years. It has now been re-opened, and is being carried deeper in the hope of obtaining a supply of water which will rise to the surface.

The brick portion of the well is 563 feet deep, with a diameter of 13 feet at the top and 7 feet at the bottom. A boring with a 7½ inch auger was made 754 feet deeper, giving a total depth of 1,317 feet. The water stands at 40 feet below the surface of the ground, and a tube about 7½ inches in diameter extends from the bottom of the brick well to a few inches above the surface of the water. The thermometer (an inverted Negretti maximum) was lowered through this tube into the boring, and, to aid in carrying it past obstructions, it was enclosed in a perforated cylindrical case of zinc, to which was attached an elongated cylindrical weight, pointed at the lower end to enable it to penetrate mud. The result showed that these precautions were necessary, the zinc case and the lower part of the weight being deeply scratched. The obstructions were chiefly met with at a depth of from 600 to 800 feet, in passing through the Upper Chalk.

The thermometer was lowered very gradually, its descent occupying nearly 15 minutes, and it met with chalk mud at a depth of 1,210 ft. from the surface of the ground. Here it was allowed to remain for 30 minutes. It was then hauled up as slowly as it had gone down, and its indication was 69°·7 F.

Observations were next taken in the same manner at two smaller depths, the temperatures recorded being 57° F. at 400 ft. and 65°·1 F. at 800 ft

These observations were made on January 18. After correspondence with the Secretary, the thermometer was again lowered to the full depth, and allowed to remain there for a week. It was hauled up on February 1, and read 69°·7—exactly the same as in the first observation; and as these observations were taken before the water had been disturbed by any preparations for continuing the boring, 69°·7 may be accepted as truly representing the temperature at 1,210 ft.

The mean annual temperature of the air at Southampton, as calculated by Mr. Shore from the daily observations at the Ordnance Survey Office, for the ten years, 1872–1881, is 50°·0 F. If we allow, in accordance with general experience, an excess of 1° in surface temperature of the soil, we have an increase of 18°·7 for 1,210 ft., which is at the rate of 1° F. in 65 ft.

The Council of the Mining Institute of Cornwall have, at the suggestion of Dr. R. S. Hudson, of Redruth, undertaken a series of observations on underground temperature in Dolcoath mine. The thermometers (of the usual slow-action pattern) were supplied by our Secretary at the expense of the Mining Institute, and the observations were taken by Captain Josiah Thomas, the manager of the mine. It is the deepest mine in Cornwall, and observations have been taken at six points at depths ranging from 252 to 2,124 ft.

The deepest of these six observations was taken under very satisfactory conditions, being in clean granite, about 90 ft. distant from any draught, and in newly-opened ground, only 24 ft. from the end of the working. The temperature observed here—the thermometer having been left for some days in a hole bored for it—was 83° F., and the mean temperature of the air in the district for the past thirty-five years is given by Dr. Hudson as 51°·4. Assuming 52°·5 as the mean temperature of the surface of the ground, we have an increase of 30°·5 in 2,124 ft., which is at the rate of 1° F. in 70 ft.

There is no pyrites in the deep workings, and no heating by chemical action has been noticed. The lode in the deepest part is chiefly composed of chlorite, quartz, and tin ores. All the holes in which observations were taken were dry. Water issues from the rock to the south of the lode at the bottom of the engine

shaft (120 ft. below the deepest of the six observations) at a temperature of about 90°.

A second set of observations under the sea has been obtained by Professor Lebour; this time from North Seaton Colliery, a few miles distant from Newcastle. A slow-action thermometer was employed, in the usual manner, and six readings were taken, all showing the same temperature, 61°. The point of observation was half a mile beyond low-water mark, and 660 ft. below mean sea-level (Ordnance datum), and about 620 ft. below the sea-bottom. Assuming the mean temperature of the sea-bottom to be 48°, we have an increase of 13° in 620 ft., which is at the rate of 1° in 48 ft.

Mr. E. Garside has taken another observation in Ashton Moss Colliery, 90 ft. deeper than before. He finds a temperature of 84° at the depth of 2,880 ft., whereas he previously found 85°·3 at the depth of 2,790 ft. The thermometer used was the same, but it was left forty-eight hours in the hole, besides three hours allowed before insertion; whereas in the previous observation (1881 Report) it was only left six hours in the hole, with ten or fifteen minutes before insertion. Assuming, as before, a surface temp. of 49°, we have an increase of 35° in 2,880 ft., which is at the rate of 1° in 82 ft.

The Secretary has been consulted by the Trustees of the Lick Observatory, about to be erected on a mountain in California, as to the advisability of taking observations of underground temperature there, and the best method to be followed. He has recommended observations at various points for comparing the temperature at 3 ft. deep with the temperature of the air.

One inverted Negretti-maximum and two slow-action thermometers have been entrusted to Mr. T. W. Edgeworth David, Assistant Field Geologist to the Mining Department in New South Wales; and two slow-action thermometers have been supplied to the Engineering Department of the South-Eastern Railway, for observations in the Channel Tunnel.

Since the publication of the "Summary," which accompanied last year's Report, the Secretary has received from Dr. Stapff a communication which renders an important modification necessary in the results for the St. Gothard and Mount Cenis Tunnels. Prof. Everett accepts Dr. Stapff's deductions, and points out that if we assume 1° in 57·8 ft. as the rate for the St. Gothard Tunnel, and also for the Mount Cenis Tunnel, instead of the rates assumed in the "Summary," the effect upon the general mean for all places will be to make it 1° F. in 60 ft., instead of 1° F. in 64 ft.

AURORA.

On some points in Prof. Lemström's experiments in Lapland.

By Mr. J. Rand Capron.

The author pointed out circumstances which led him to consider Prof. Lemström's experiments in Lapland, inconclusive as to the nature of that phenomenon; and in view of the existing sun-spot epoch, advocated experiments in this country, in the same direction.

For this purpose the apparatus mentioned as necessary would be:—

1st. A "collecting" apparatus generally similar to that employed by Prof. Lemström, but modified to suit local circumstances; in

which the mainly important point is the use of insulators upon the Mascart system,

2nd. A spectroscope of large aperture and small dispersion, but provided with some means of accurately measuring the line positions. The disadvantages of most forms of micrometer were pointed out, and it was urged that for line-measurements in so faint a spectrum all extraneous light should be avoided. A form of micrometer was then suggested, by which the auroral light alone was used. It consisted of a slit plate, of which the upper half, and consequently the upper of two superposed spectra, was made to traverse by a suitable micrometer screw the lower, and the bright "citron" line of the aurora was employed to measure the position of the fainter lines. (This slit plate was exhibited and described.)

3rd. A galvanometer for the measurement of the intensity and direction of earth currents.

4th. An electrometer of the Thomson "Quadrant," or "Portable" pattern for the examination of the character and degree of atmospheric electricity at and about the time of auroral displays.

5th. Some simple form of theodolite or alt-azimuth instrument for the measurement of magnetic positions, altitudes, inclinations, &c., of auroral arches and beams.

Lastly. Mr. Capron pointed out that Prof. Lemström's collected (not "artificial") aurora, had not been compared with other gaseous or chemical spectra, that hitherto no spectrum of an artificial electrical discharge had been found comparable with the aurora spectrum, and that now, if an aurora could be, so to speak, held captive, would be the opportunity for the chemists to come in aid of the spectroscopists, for the solution of the auroral mystery.

In reference to this subject, Mr. Capron informed us that he has prepared a set of apparatus for observations, in case of coming auroræ.

The galvonometer is of the double needle form, with special arrangements for regulating the amount of tension, and wound to a resistance of 1,004 ohms. The electrometer is a modification of Sir William Thomson's quadrant with similar arrangements for regulating deflection. The theodolite is at present a wood and card-board model, with arrangements for taking positions from the magnetic pole, altitudes from a given horizon, inclination and angles of beams, &c. Polariscopic eye-pieces are added, to enable observations on this disputed question to be made. It is proposed to erect a collecting apparatus on a tower, which is a prominent feature on the Hog's-back chalk ridge, near Guildford, and is the nearest suitable elevation to the Guildown Observatory.

MARINE ANEMOMETER.

By W. G. Black, F.M.S.

The principle of the marine anemometer exhibited was suggested by the sail of a ship, the pressure of wind upon a small one being registered on a scale.

A short hollow tube or mast carries a sail one foot square attached to a fixed yard above, and to another yard below, which is free. From this proceeds a sheet or cord, which descends to pass under a pulley let into the lower end of the mast, and then ascends inside it to be attached to a moveable plug carrying an index. In the upper half of the mast lies a spring-wire-coil, fixed above, but free below to be attached to the plug carrying the index.

The stronger the wind the greater the belly of the sail, and therefore the more do the yards approach each other, and therefore the greater the tension of the spring and the greater the pressure indicated, as the sheet or cord will always be kept taut by the spring, so will the body of the sail be always tightly stretched and full of wind.

The scale on the outside of the mast is divided into inches and pounds to indicate by the movement of the pointer the pressure on the sail, and its extent of abduction. The mast carries a loose vane on the top, and is planted into a solid plinth below, which has an index on its outside rim.

This again revolves horizontally on a fixed plinth below, attached by a screw, bolt, and nut to the railing of the ship, and bears on its outside rim a scale of degrees. This scale will indicate the direction of the wind pointed to by the vane, in relation to the course of the vessel, and also the bearing of the sail to the ship and vane. When in use, the sail will require to be turned by hand towards the direction of the apparent wind, and the pressure and direction can then be read off on the scales.

In order to find out the true direction and force of the wind it will be requisite to construct a diagram of the triangle of forces in terms of velocity of wind per mile. One side would be put down to represent the speed of the ship in miles per hour, another side the velocity of the wind indicated by the scale; the angle would be read off from the plinth, and the third side would be drawn joining the extremities of the other two.

The length of this side would indicate the velocity of the true wind in miles per hour, and its direction the true angular course of the wind outside the ship. A model has beeen stationed on a ship going to Brazil, and its performance in the open sea will in due time be reported.

ON MEASURING THE HEIGHT OF CLOUDS.

By Prof. Luröth, of Freiburg, Baden.

Of this communication we have not yet received a full abstract, and therefore we may have occasion to refer to it subsequently, but we believe that the idea was to project a beam of powerful electric light vertically towards the zenith, and that simultaneous trigonometrical measurements should be taken of the luminous spot which would be thereby formed.

A very brief discussion followed, in which Mr. Symons stated that

he believed something slightly approaching this method had occasionally been tried at the Royal Observatory, Greenwich, by noting the altitude at which the lights of London were reflected by the clouds hanging over it.

NEGRETTI & ZAMBRA'S TURNOVER THERMOMETERS.

WE ought, perhaps, to apologise to Messrs. Negretti for not adhering to the title which they have given to the apparatus we are about to notice; but there are two reasons for not doing so. In the first place, most of our readers know the merits of Negretti's turnover thermometers, and will almost immediately completely understand the new arrangement; and, secondly, we object to the title, "Negretti and Zambra's Patent Hourly Recording Thermometrical Apparatus," on several grounds. It is too long for the present quick-thinking generation; it does not individualize their arrangement from the many patterns of recording thermographs, and, lastly, we think that to be entitled to the designation of hourly, there should be 24 thermometers rather than 12.

All these matters are, however, non-essential. We have to criticise the apparatus as it stands, and to see how far we should or should not be justified in recommending its general use.

As regards the action of these turnover thermometers we have nothing to say except praise. We have had a double turnover, *i.e.*, a dry bulb and a wet bulb, at work for many years, and we cannot recollect it failing to act on a single occasion, although it and its clock have been exposed in all weathers to wet, snow, fog, and all the evils of a London atmosphere. Hence it was that we advised Mr. Wragge to establish one on the top of Ben Nevis, and there also we believe that it acted perfectly.

In the present apparatus the novelties are twofold. First, that there are a dozen thermometers, so that by reading twice daily, the absolute temperature at each hour could be obtained; or by reading once daily, and slightly altering the clock, the temperature by a single reading could be obtained at each two hours. Secondly, the thermometers are turned over by an electric current, instead of by the direct action of the clock. This latter novelty enables the clock to be kept at a distance from the thermometer, and, therefore, to be protected from the weather. Our personal experience of out-of-door clocks (and we have three at work—one upon a Glaisher thermometer stand, one in a Stevenson stand, and one in a Casella's recording rain gauge) is, that they suffer very little from exposure, and as we never use electrical arrangements where mechanical ones will suffice, we should for most stations prefer that the thermometers were released mechanically, which would, we think, be both more certain and less costly than the electrical arrangement.

We do not overlook the fact, that the electrical arrangement allows the thermometers to be exposed "at any distance from the

clock and battery," but we do not see what is gained thereby. The observer must visit the thermometers in order to read them, and therefore they cannot be placed in a difficultly accessible position, and where the thermometers are, there the clock may very well be.

Before summing up the merits and demerits of the apparatus, it may be well, for the benefit of those not used to this pattern of thermometer, to state its principle very briefly. It is essentially that of Negretti's maximum thermometer, viz., a rather large-bulb-thermometer filled with mercury, and with its tube obstructed at a point near the bulb. While the bulb is at the bottom, the mercury rises and falls past the obstruction, when the thermometer is suddenly turned bulb uppermost, the column of mercury breaks off at the obstruction, falls to the other end of the tube and remains there, the length of this detached portion shows the precise temperature at the instant of its being turned over.

Let us now consider—

Merits.	Demerits.
It is perfectly accurate, and not liable to derangement.	It does not give a continuous record, and therefore would not give details of the passage of squalls of hot or cold air; in short, it is not well adapted for what may be called charto graphic meteorology.
It is very easily manipulated.	
There are none of the many worries of photographic registration.	
It is far less liable to injury in carriage than most thermographs.	
An apparatus with 12 thermometers read once daily, *i.e.*, a set of two hourly readings, would, in the course of very few years, give the diurnal range-curve as accurately as is at all necessary.	

REVIEWS.

Handbuch der Klimatologie. Von Dr. J. Hann. 8vo. x.—764 pages. Stuttgart: Engelhorn, 1883.

Dr. Hann's reputation for ability and industry stands so high that merely to mention the title of this work, and its author, is sufficient to recommend its purchase by all meteorologists who are conversant with German, and the very solid volume now before us would amply justify the anticipation.

A brief introduction, pointing out the true domain of climatology and wherein it differs from meteorology and from mere weather records is followed by a carefully-worded and fully-illustrated consideration of the various meteorological elements which, combined, afford the numerical exponents of the climate of every place. This section occupies 54 pages.

The next section deals with climates in general, being divided into solar and terrestrial climates, with sub-division for solar radiation,

land and sea climates, and the influence of altitude upon climate. These subjects occupy 174 pages.

The great bulk of the volume (536 out of 774 pages) is devoted to "special climatology," divided primarily into tropical, temperate and polar zones, and sub-divided into about thirty sections. The work already done by Dr. Hann in preparing for insertion in the *Zeitschrift*, the many notes upon local climate which have appeared therein, have stood him in good stead in the present work, and the result is one which is as creditable to the author as it is useful to all intrested in the subject.

Probably the best idea of the work will be conveyed by translating the paragraphs relating to one district, as a type of those given for others—it is quite immaterial which, and as we open the book upon page 374 we take it—it is a portion of the section devoted to tropical America :—

"*Climate of the Andes and of the West Coast.* The places whence regular observations have been obtained are shown in the table. [Too long to quote here.] From which it will be seen that at Bogota, 8,727 ft. above the sea, the warmest month has about the same temperature as the middle of May in Vienna, and the coldest month that of the first days of May, whence the uniformity of the temperature is evident. The entire range lies between 43°·5 and 74°·3.

"Humboldt describes the climate of Bogota as a perpetual spring, but the popular saying is nearer the truth in asserting that the year consists of ten months rain, and two months heavy rain. The perpetual spring is in fact a perpetual April, and moreover without any stoves or arrangements for warming the houses. If between two showers the sun shines forth with full force, the houses with their ever-damp walls of unburnt bricks appear doubly damp and icy. In the summer months there are visitations of a peculiar cold wet mountain mist known as "Paramitos" which without warning wraps the town in a gray cloak, and vanishes with equal suddenness. (M. v. Thielmann).

"Similar but still colder and more like our German April weather is the climate of Quito.

"Whymper is also no admirer of the renowned equability of the climate of the high plateaus of the Andes. He says—"I do not myself profess entire admiration for it, for the incomparable—some persons say, the abominable laziness of the Ecuadorians has an intimate connection with the much admired equability of climate, which renders it almost certain that to-morrow will be like to-day. They therefore put off doing everything until to-morrow, and when to-morrow arrives until the next day, and so on." The temperatures which Whymper observed on the Andes near Quito were—on Chimborazo (20,516 ft.), on January 4th, 21°; on July 3rd, from 15° to 20°; Cotopaxi (19,550 ft.) having spent the night on the summit, February 18th, 13° to 21°; Cayambe, 19,190 ft., April 4th, 32° to 41°. At Antisana (19,260 ft.) the temperature was remarkably high and variable on March 10th, within two hours in the shade and with a calm air the temperature varied from 44° to 60°.

The highest temperature which Whymper observed in Ecuador was 75°·6 in the plain of Quallabamba [N. of Quito]."

In order to complete the illustration we extract from the tables some of the numerical data.

STATIONS.	Latit ude.	Altitude.	TEMPERATURE.					RAIN
			Yearly Mean.	Coldest month.	Warmest month.	Absolute. Min.	Max.	
		Feet.	°	°	°	°	°	In.
Bogota (3 yrs.).	4°35′ N.	8,727	57·9	Aug. 56·1	Mr. No. 59·2	43·5	74·5	73·94
Quito (1½ yrs)..	0°14′ S.	9,350	55·6	July 54·5	No. Ja. 56·5	37·9	74·8	46·66
Antisana (1 yr.)	0°21′ S.	13,320	40·8	Jy.,Au. 37·4	Jan. 43·2	20·8	51·8	...

If our readers will in imagination multiply the above information by 500 and add thereto short notes on all branches of climatology, from that of the influence of Arctic cold upon the human frame to the laws of the cyclones in the Bay of Bengal, and from the relative humidity of climatic health-resorts to the influence of the earth's rotation upon the direction of the great currents of the atmosphere, they will begin to realize the treasury of information which Dr. Hann has given to the world.

There is, as far as we can see, only one respect in which the book could be improved, namely, by giving references to the books quoted. Dr. Hann is most conscientious in giving credit to the authors of most of the statements which he quotes, but we should have preferred references in full, as for example in Schmidt's *Lehrbuch*. We may illustrate this by the very quotation which we have made. Humboldt is said to have called the climate of Bogota perpetual spring, words which convey ideas very different from those suggested by M. v. Thielmann. Persons interested in the Bogota climate would naturally like to consult M. v. Theilmann's work and judge whether he or Humboldt is to be believed.

The book is so good that a second edition cannot be a remote possibility, and when it appears, this additional information would, we think, be useful.

Wiesen as a Health Resort in Early Phthisis. By A. T. TUCKER WISE, M.D., F.R.Met. Soc., &c. Post 8vo, 77 pages, several folding tables and map. London : Baillière, 1883.

THE *Lancet* says that "There can be no doubt that Davos is an invaluable resort for many young and active people with incipient phthisis," and therefore we have nothing to do but to bow reverentially before the *Lancet*, Dr. Tucker Wise, Dr. Weber, Dr. Theodore Williams, Dr. Burney Yeo and others. No doubt it is quite true and quite right, but to a non-medical mind it seems rather droll, that whereas in past times all possible care was taken to select mild

climates like Ventnor, Penzance, and the string of health resorts along the northern shore of the Mediterranean, we are now told that the correct thing is to go up into the most cold and snowy valley that can be found. And we are not helped out of our puzzle by the author of the work before us saying on page 5, that one of the advantages of Andermatt is, that being "on the St. Gothard line, visitors can move on to the Riviera in a few hours if the mountain air is found unsuitable."* That would be a change of climate with a vengeance, and seems to contradict the explanation of the choice of antithetical localities which we had intended to submit, viz., that different varieties, and stages, of disease required one or the other extreme.

Fortunately it is not our duty to consider the proper climate for invalids, but to report upon Dr. Tucker Wise's book as a contribution to climatology.

Somebody—probably not the author—has made a muddle of determining the altitude of Wiesen. It is to be hoped that they refer to different parts of the village; if so, the author should have said so; if they do not, the following differences are not creditable to the parties concerned:—

Altitude of Wiesen above Sea Level	{	5050 ft....Swiss Metorological Society. 4990 ft....Dr. Frankland, F.R.S. 4771 ft....Dufour's Trigonometrical Survey.

Concerning the section headed "Meteorological Notes" we have but few remarks to offer. The comparability of the temperature records was risked—we do not say injured—by the erection of a canvas screen to protect the Stevenson's stand from the intensity of the sun's rays. In all probability its effect was inappreciable, but if it had been, it would have been so much the worse, for then the results would not have been comparable with those of other stations.

Dr. Tucker Wise, deserves the thanks of meteorologists for the evidently extremely careful way in which he kept his meteorological records during last winter. But he adds one more to the many instances which prove the necessity of actual training and teaching before commencing the keeping of a register. Let us not for a moment be misinterpreted—we really accept the figures given as valuable, as accurate, and as absolutely true—but Dr. Wise need not, and should not, have read his max. and min. thermometers two, three, or even four times a day; nor should he enter as the mean of a month, the mean of 20 out of 28 days.

The purchase of a perfect set of instruments, the trouble involved in their transport across two-thirds of Europe, their erection in a snow-clad village, their observation with great regularity generally four times daily, and finally the printing *in extenso* of the observations,

* The author, however, plunges us into another difficulty a few pages further on, p. 18:—"On the other hand, the advisability of making a rapid descent from a high altitude to the low-lands, even for convalescents, is questionable." Just so; but if so, what becomes of the advantage of Andermatt.

form collectively abundant evidence of devotion and zeal. The faults which we have mentioned are capable of easy reparation, and they only prove what we have often urged, the necessity of instruction in meteorology being made a part of all first-class educational systems.

In conclusion, we desire to add one word of very hearty praise, viz., for the most unusual impartiality of the author. As a too general rule, writers upon the climate of any locality see it always through rose-coloured glasses. Dr. Tucker Wise seems to us tobe impartiality personified.

AN EXTRAORDINARY METEOR.

WE quote the following wonderful story from *Nature* of November 1st. Our contemporary gives it on its own authority, and we reprint *verb. et liter.* :—

"On Monday, September 24th, about 9 p.m., a remarkable phenomenon occurred at Käringön, in the province of Bohus, Sweden. During a perfect calm a whirlwind suddenly arose from the south-east, carrying with it a quantity of sand, earth, and straw, when suddenly a bright light lit up every object and made the night as clear as day. This was caused by a magnificent meteor, egg-shaped in form, which appeared in the zenith, and which at first seemed to consist of myriads of large sparks, gradually changing into a star shining with a blinding lustre, and which burst, with all the colours of the rainbow, in the north-west, four or five metres above the horizon. When the meteor had disappeared, the wind suddenly fell, and it was again perfectly calm. The phenomenon lasted about sixty seconds. The wind had throughout the day been south and very slight.

RAINFALL IN CENTRAL AFRICA.

IN the *Annuaire* of the *Soc. Met. de France* for May of the present year, M. A. Angot gave an interesting summary of Meteorological observations made near Tanganyika; he has recently favoured us with the continuation of them down to the end of 1882. From these two sources we have compiled the table on the following page.

Doubtless in such a mountainous district as that in which these observations have been made, and scattered as the stations are over an area larger than England and Wales, considerable differences in amount will exist. There is no information as to how the rain gauges were placed, and we have no information as to the seasons being average, or very wet,or very dry. But in spite of all these uncertainties, we have thought it worth while to try and ascertain the yearly mean fall which they indicate, and also its seasonal distribution. The values are so uncertain that it is not worth while to explain the steps by which they have been obtained, and they are offered only in the absence of anything better.

Urundi, average yearly total, 52 in.
Massanzés ,, 56 in.
Victoria Nyanza ,, 63 in.

Monthly distribution in inches, average for the three stations :—

Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
7	6	6	11	6	1	1	2	2	2	4	8	56

Month.	Tanganyika.						Victoria Nyanza.		
	Urundi.			Massanzés.					
	Total	Days over ·02	Days under ·02	Total	Days over ·02	Days under ·02	Total	Days over ·02	Days under ·02
	in.			in.			in.		
1880									
December.. ...	5·43	20	5	...	...	...	...	...	...
1881									
January	7·05	17	12	...	...	...	..	...	..
February	5·47	14	3	...	...	...	...	...	...
March	4·88	13	1	...	...	...	...	...	...
April.....	9·13	21		...	...	...	12·40	20	
May	*2·32	5		...	...	...	4·33	14	3
June	...	...	...	...	...	...	2·17	14	
July	...	...	...	† ·83	2		3·07	9	
August.....	...	...	...	‡ ·24	2		5·59	13	1
September ...	...	...	...	·35	1	...	3·47	10	1
October.....	..	...	...	§ ·24	1	...	‖ ·16	3	1
November ...	...	...	...	...	...	...	...	...	...
December.....	...	...	...	...	...	...	...	...	...
1882									
January	...	...	...	...	...	...	...	...	...
February	...	...	...	...	...	...	...	...	
March	...	...	...	¶4·02	5	4	...	...	...
April.....	...	...	...	10·43	20	4	...	...	..
May	...	...	...	7·87	15	2	...	...	...
June	...	...	...	·00	0	0	...	...	...
July	...	...	...	·00	0	0	...	...	...
August.....	...	...	...	·51	1	0	...	...	...
September ...	...	...	...	1·22	3	1	...	...	..
October.....	...	...	...	2·95	7	4	...	...	...
November ...	...	...	...	4·57	12	5	..	...	...
December.....	...	...	...	9·73	18	2	...	...	...
Max. daily fall	2·56in. Jan. 12, 1881			3·74in., April 26, 1882			2·28in., April 24, 1881		
Lat.	? 4° S.			? 4° S.			0° 19′ N.		
Lon.	? 30° E.			28° E.			33° 0′ E.		
Altitude							5580 ft. ?		

* To 9th only. † From 13th. ‡ To 17th only. § To 17th only. ‖ To 4th only. ¶ From 12th.

TONQUIN.

We are glad to be able to announce the safe arrival, at Hanoi, of Dr. Borius. All his instruments, both self-recording and others, had travelled without injury, and were in operation at the date of last advices. Dr. Borius has found that a record of well-placed instruments has been kept at Hue, and he is preparing a summary of the results.

SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1883.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	3·16	XI.	Llanfrechfa Grange	3·82
,,	Margate, Birchington...	2·04	,,	Llandovery	5·39
,,	Littlehampton	2·72	,,	Solva	2·61
,,	St. Leonards	3·31	,,	Castle Malgwyn	5·16
,,	Hailsham	2·72	,,	Rhayader, Nantgwillt..	6·89
,,	I. of W., St. Lawrence.	2·76	,,	Carno, Tybrith	6·53
,,	Alton, Ashdell.....	2·96	,,	Corwen, Rhug	5·30
III.	Winslow, Addington ...	1·92	,,	Port Madoc	6·06
,,	Oxford, Magdalen Col...	1·90	,,	I. of Man, Douglas	4·58
,,	Northampton	1·62	XII.	Carsphairn	...
,,	Cambridge, Beech Ho...	1·41	,,	Melrose, Abbey Gate ...	3·72
IV.	Southend	1·59	XIII.	N. Esk Res. [Penicuick]	3·90
,,	Harlow, Sheering	1·91	XIV.	Ayr, Cassillis House ..	5·86
,,	Diss	2·95	,,	Glasgow, Queen's Park.	3·28
,,	Swaffham	4·26	XV.	Islay, Gruinart School..	4·67
,,	Hindringham	3·59	XVI.	St.Andrews,NewtonBk	2·22
V.	Salisbury, Alderbury ...	2·66	,,	Aberfeldy H.R.S.	3·69
,,	Warminster	2·86	,,	Dalnaspidal H.R.S. ...	8·89
,,	Calne, Compton Bassett	2·30	XVII.	Keith H.R.S.	1·64
,,	Beaminster Vicarage ...	3·86	XVIII.	Forres H.R.S.	1·03
,,	Ashburton, Holne Vic..	7·20	,,	Strome Ferry H.R.S....	6·81
,,	Torrington,LangtreeW.	...	,,	Lochbroom	7·39
,,	Lynmouth, Glenthorne.	5·20	,,	Tain, Springfield.....	2·32
,,	Probus, Lamellyn	4·17	,,	Loch Shiel, Glenaladale	13·38
,,	Taunton, Fullands	2·62	XIX.	Lairg H.R.S.	4·57
VI.	Bristol, Clifton	3·42	,,	Forsinard H.R.S.	4·68
,,	Ross	...	,,	Watten H.R.S.	2·78
,,	Wem, Sansaw Hall.....	2·77	XX.	Fermoy, Glenville	3·58
,,	Cheadle, The Heath Ho.	3·67	,,	Tralee, Castlemorris ...	4·28
,,	Worcester, Diglis Lock	2·44	,,	Tipperary, Henry Street	3·45
,,	Coventry, Coundon	3·00	,,	Newcastle West	3·95
VII.	Melton, Coston	2·16	,,	Kilrush	...
,,	Ketton Hall [Stamford]	1·78	,,	Corofin	3·70
,,	Horncastle, Bucknall ...	2·80	XXI.	Carlow, Browne's Hill..	2·04
,,	Mansfield, St. John's St.	2·99	,,	Navan, Balrath	2·77
VIII.	Macclesfield, The Park.	5·16	,,	Athlone, Twyford	3·54
,,	Walton-on-the-Hill... .	5·06	XXII.	Mullingar, Belvedere ...	3·11
,,	Lancaster, South Road.	4·57	,,	Clifden, Kylemore	8·19
,,	Broughton-in-Furness ..	6·60	,,	Crossmolina, Enniscoe..	5·99
IX.	Wakefield, Stanley Vic.	2·98	,,	Carrick-on-Shannon ...	3·40
,,	Ripon, Mickley	3·09	XXIII.	Dowra	...
,,	Scarborough.....	3·47	,,	Rockcorry.....	3·41
,,	EastLayton[Darlington]	2·65	,,	Warrenpoint	3·36
,,	Middleton, Mickleton ..	3·57	,,	Newtownards	2·82
X.	Haltwhistle, Unthank..	3·71	,,	Belfast, New Barnsley..	4·13
,,	Shap, Copy Hill	7·00	,,	Bushmills	3·25
			,,	Buncrana	4·75

OCTOBER, 1883.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·75	— ·95	·46	15	14	64·6	15	36·9	22	0	3
II.		Maidstone (Hunton Court)...	2·66	+ ·20	·80	4	13	...	...	...	...	...	...
,,		Strathfield Turgiss	1·77	— ·97	·44	15	16	62·4	10	34·8	22	0	8
III.		Hitchin	1·87	— ·31	·39	14	13	60·0	16	35·0	22	0	...
,,		Banbury	2·25	— ·51	·77	15	14	62·0	8	35·5	7	0	...
IV.		Bury St. Edmunds (Culford)	2·83	+ ·66	·60	3	15	63·0	25	34·0	2, 21	0	..
,,		Norwich (Cossey)	3·59	+ 1·26	·94	3	18	63·0	25	37·0	22	0	0
V.		Bridport	3·21	...	·88	15	17	...	..	...	...	...	...
,,		Barnstaple.....	5·02	— ·43	·72	15	16	65·0	10	41·0	21*a*	0	..
,,		Bodmin	4·48	— 1·79	1·02	13	20	60·0	9	31·0	21	0	1
VI.		Cirencester	2·77	— ·47	·49	14	14	..	...	...	...	...	...
,,		ChurchStretton(Woolstaston)	3·38	— ·72	1·04	15	23	65·0	8	35·0	22	0	2
,,		Tenbury (Orleton)	2·78	— ·46	·88	15	20	63·2	25	32·0	7	1	4
VII.		Leicester	2·16	...	·43	3	22	64·2	8	37·0	7, 21	0	9
,,		Boston	2·43	+ ·40	·60	14	14	65·0	8	37·0	22	0	...
,,		Grimsby (Killingholme).....	3·75	+ 1·10	·92	14	24	65·0	8	37·0	22	0	...
,,		Hesley Hall [Tickhill].....	3·17	...	·66	3	16	67·0	8	33·0	22	0	...
VIII.		Manchester (Ardwick).....	5·24	+ ·81	·76	16	17	65·0	14	33·0	22	0	...
IX.		Wetherby (Ribston Hall) ...	2·60	— ·76	·75	17	11	...	...	...	...	...	...
,,		Skipton (Arncliffe)	8·65	+ 1·39	1·48	16	23	64·0	8	27·0	21	2	...
X.		North Shields	1·58	— ·93	·43	3	17	63·8	9	29·0	22	1	1
,,		Borrowdale (Seathwaite).....	15·62	— ·93	3·02	22	21	61·6	8	28·2	22	...	...
XI.	WALES.	Cardiff (Ely).....	4·55	— ·68	·80	15	16	...	...	...	...	...	...
,,		Haverfordwest	5·08	— 1·37	1·30	14	17	64·0	8	31·5	6	1	3
,,		Plinlimmon (Cwmsymlog) ...	6·80	...	·91	2	21	...	...	...	..	...	...
,,		Llanduduo.....	4·11	— ·48	1·06	16	20	61·0	9, 29	38·5	22	0	...
XII.		Cargen [Dumfries]	3·78	— 1·93	·69	14	15	65·2	8	25·8	22	2	...
,,		Hawick	3·54	+ ·37	·82	17	17	...	...	.	...	..	...
XIV.		Douglas Castle (Newmains)	6·38	+ 1·44	·89	14	17	..	...	...	...	...	...
XV.		Lochgilphead (Kilmory).....	7·52	— ·80	1·12	13	23	...	...	...	...	...	...
,,		Appin (Airds)	6·05	...	...	...	...	...	...	..	...	...	...
,,		Mull (Quinish).....	8·12	...	1·72	13	28	...	...	.	...	...	.
XVI.		Loch Leven Sluices	3·70	— ·61	·90	19	...	...	...	...	...	...	...
,,		Arbroath	1·56	— 1·31	·35	14	12	65·0	7	33 0	22	0	...
XVII.		Braemar	3·57	— ·91	·65	14	20	67·0	7	26·3	12	2	24
,,		Aberdeen	1 97	...	·76	14	14	74·0	8	30·0	11*b*	3	...
XVIII		Skye (Sligachan)	15·34	...	4·62	13	27	...	...	...	...	...	...
,,		Culloden	1·73	— ·56	..	...	...	59·0	14	31·0	10	1	13
XIX.		Dunrobin	4·43	...	1·50	19	17	69·0	8	31·0	12	...	...
,,		Orkney (Sandwick)	4·03	— ·26	·53	24	23	58·8	9	38·6	3	0	4
XX.	IRELAND.	Cork (Blackrock)	3·00	— 1 74	·58	15	17	71·0	8	33·0	19	0	...
,,		Dromore Castle .,.....	5·39	...	·90	15	19	62·0	8	34·0	20*b*	0	...
,,		Waterford (Brook Lodge) ...	2·97	...	·56	15	17	62·0	7	27·5	22	1	...
,,		Killaloe	4·83	...	·58	16	19	70·0	8	32·0	21	1	...
XXI.		Portarlington	2·32	— 1·15	·46	15	17	63·0	8	34·0	21	0	...
,,		Dublin (FitzWilliam Square)	2·20	— 1·22	·44	24	16	63·8	8	34·5	22	0	1
XXII.		Ballinasloe	...	...	...	...	...	...	...	...	...	...	...
XXIII.		Waringstown	3·25	— ·36	·51	24	17	68·0	8	29·0	21	1	7
,,		Londonderry (Creggan Res.).	4·56	...	·50	22	24	...	...	...	...	...	...
,,		Omagh (Edenfel)	5·02	+ ·70	·65	24	25	62·0	8,9	30·0	21	1	...

+ Shows that the fall was above the average : − that it was below it.

a And 22. *b* And 21.

METEOROLOGICAL NOTES ON OCTOBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—An unsettled month, colder at the close, with one or two gales and considerable rainfall, but not more than was needed for the newly-seeded land; the seed-time so far has been most favourable, greatly contrasting with last year.

BANBURY.—Mean temp. of the month 49°·4; high wind on 10 days; parhelion seen on 2nd; on 17th a little after 2 p.m. fragments of halos were seen with very delicate prismatic colouring about the sun, upon a ground of fine snowy cirro-cumulus with at one time incomplete smaller circles of a reddish colour.

CULFORD.—Heavy rains and high winds were frequent throughout the month, but there was a good deal of mild, bright weather.

COSSEY.—Notwithstanding the heavy rains which occurred during the latter part of September and the early part of October, the land was in a good state for wheat sowing, and that important operation may be said to have been completed in this county by the end of the month.

BODMIN.—Mean temp. of the month 51°·9 being 1°·0 below the average.

CIRENCESTER.—Rainfall moderate, a seasonable month for agricultural purposes.

WOOLSTSATON.—The latter part of the month was very favourable for the autumn sowing. Mean temp. 48°.6; sharp storm with T and L on 3rd; severe gales accompanied by H from 15th to 17th.

ORLETON.—The sky was generally covered with cloud, and there was very little sunshine during the month; the air was generally damp, and heavy falls of R occurred on the 14th and 15th. The temp. was generally steady, and the mean was slightly below the average; very rough winds occurred on the 4th and 15th; distant L was seen on the night of the 3rd.

LEICESTER.—The month was mild though damp and cheerless, R falling on 22 days.

KILLINGHOLME.—The weather during the greater part of the month was very wet, almost daily R retarding the harvest of the late crops, but the last week was fine and mild, and wheat sowing was carried on under far more favourable conditions than last year.

ARDWICK.—On the whole an unsettled month, with a pretty heavy rainfall; the weather about the middle was very stormy, but towards the end it became more settled, with a few fine days; frost on one or two mornings.

WALES.

HAVERFORDWEST.—From 3rd to 6th, stormy, very rough and cold, with H, T and L on the evening of the 3rd; very close damp weather from the 8th to 10th; after which stormy weather with variable temp. prevailed till the 22nd, with low bar. min. 29·171 in. at 4 a.m. on 16th; very heavy gale on the 15th, from S.W., about 5 p.m. the wind shifted to N.W. when it blew very hard, heavy R falling with squalls of great violence through the night; on the 16th at 2.30 a.m., I was out and experienced a terrific squall of wind accompanied by tremendous H, T and forked and sheet L, the hailstones were very large; near St. Davids, the L struck and fused a great length of telegraph wire, some animals were also killed. The spring tide and flood with the wind from S.W. combined to produce the highest tides that have been recorded during the last 20 years. From the 21st to the end of the month the weather was mild, calm and cloudy; on many days the sun was never visible; no frost; wild strawberries in blossom.

LLANDUDNO.—Mean temp. about the average. The temp. was very equable, the range, both diurnal and monthly, being considerably less than the average; the relative humidity was also below the average, though the

number of rainy days exceeded it. Sharp TS at 4.45 p.m. on 3rd; much L in the evening, and another slighter storm on the 16th; sunshine deficient, only 90 hours.

SCOTLAND.

CARGEN.—Mean temp. 1°·3 below the average, sunshine also below the average. A very sudden rise of temperature occurred on the night of the 24th-25th; the max. temp. of the 24th was 48°·2, and at 9 p.m. it was 46°·2. Shortly after this the temp. commenced to rise quickly and continued to do so till 1 a.m. of the 25th, when it stood at 57°·2. This sudden rise in the temp. was accompanied by a gale from the S.W. with heavy R. At 9 a.m. of the 25th, the ther. stood at 50° and the max. during the day was 51° thus the temp. shortly after midnight exceeded by 6°·2, the highest day temp. of the preceding and following days, and in fact the maximum temperature of the ten previous days. A deep depression travelling very rapidly in an easterly direction passed the N. of Scotland on the night of the 24th-25th.

HAWICK.—The month on the whole was cold and wet; but the last four days were remarkably warm and mild. Loud T on afternoon of 17th; green peas gathered throughout the month.

QUINISH.—A cold, wet, stormy month.

ABERDEEN.—The max. temp. 74° on the 8th is also the max. during the year, and there was a total immunity from E. winds during the whole month, which is quite exceptional here, and has not occurred previously since 1874. Rainfall an inch below the average; auroræ observed on 5th and 20th.

CULLODEN.—The month was dry and fine up to the 14th, and the temp. very equable; heavy gale on 27th, and early morning of 28th.

SANDWICK.—On the first 3 days of the month H and S showers occurred with frost at night, but afterwards the weather was more favourable, and the grain crops were secured in good condition; the potato crop is particularly good both as to quantity and quality. October is generally our wettest month, and it has been wetter than any previous month this year, but drier than the mean of the previous 42 years. T and L on 18th at 8 p.m.; a storm of wind of 70 miles an hour on 25th from 9 to 11 a.m. Bright aurora was seen on 5th, and as it was an observation of the late Sir Robert Christison that the first bright aurora in harvest was followed by fine weather next day, and coarse weather on the following one, I ventured to give warning, and the observation proved to be correct.

IRELAND.

DROMORE CASTLE.—A wet stormy month with high temp.; heavy gale on the night of the 12th, L and T on the 15th. Great difficulty was experienced in gathering the corn and hay, which remained in large quantities in the field at the close of last month.

WATERFORD, BROOK LODGE.—Month generally dull and close; R is below the average, no heavy fall; L on 24th.

KILLALOE.—Constant R from 12th to 25th, with frequent severe squalls from S. and S.W.; mean temp. (50°·4) below the average.

DUBLIN, FITZWILLIAM SQUARE.—Changeable as October generally is, this month proved no exception to the rule. The mean temp. was as nearly as possible equal to the average of 18 years, but it is noteworthy that the first week was decidedly colder than the last week, and that a remarkable increase of temp. occurred on the 7th, lasting for several days. The rainfall was considerably below the average, and the number of rainy days also fell short of the average; L on 3rd and 15th; solar halos on 5th, 12th, 19th and 22nd; lunar halos on 11th and 15th. Fog on 8th, 12th and 29th.

WARINGSTOWN.—A damp month, temp rather above the average, oat crop very late, and fields only completely cleared during the last week of month.

EDENFEL.—With the exception of the second week and a few dull humid days at the end of the month, the weather of October was extremely wet stormy and inclement; much grain was still out in the mountainous districts at the close of the month.